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DEPARTMENT OF THE INTERIOR.  
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F. V. HAYDEN, U. S. GEOLOGIST-IN-CHARGE.

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## CATALOGUE

OF

# MINERALS FOUND IN COLORADO.

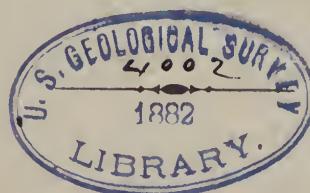
BY

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## F. M. ENDLICH.

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[ EXTRACTED FROM THE TENTH ANNUAL REPORT OF THE  
SURVEY, FOR THE YEAR 1876.]



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
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## MINERALOGICAL REPORT OF F. M. ENDLICH, S. N. D.

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### LETTER OF TRANSMITTAL.

WASHINGTON, D. C., January 2, 1878.

SIR: I have the honor herewith to transmit the "Catalogue of Minerals found in Colorado." It has been made as complete as possible, up to date.

A plan differing from that previously followed has been adopted. So far as practicable, analyses of Colorado minerals have been given. They will aid examination and show the interest taken by specialists in the minerals from this State. All available material has been utilized in the preparation of the catalogue. A systematic enumeration of the Colorado mineral species and references to the publications thereon have been added.

I desire here to thank those gentlemen to whom I am indebted for verbal and written information.

Hoping that the subjoined pages may meet your requirements,

I am, very respectfully, your obedient servant,

FREDERIC M. ENDLICH.

Dr. F. V. HAYDEN,

*Geologist in-charge United States*

*Geological and Geographical Survey of the Territories.*





# CATALOGUE OF MINERALS FOUND IN COLORADO.

BY F. M. ENDLICH, S. N. D.

The continuous development of mineral resources of Colorado is productive of a more complete knowledge, not only of their distribution, but of their specific character. In 1873, I published my first catalogue of minerals of that Territory. An enlarged list was printed in the United States Geological Report for 1875. Now, the survey of Colorado is completed, many additions of species new to the State and of new localities for known ones have been obtained. With a view, therefore, of presenting, as complete as possible, a catalogue of Colorado minerals I have undertaken its preparation a third time. In so doing, I have availed myself of all accessible material. Publications and private communications by the following gentlemen have furnished very material aid in the completion of the work: Dr. F. V. Hayden, United States Geologist; Capt. E. L. Berthoud, Golden, Colo.; Prof. J. D. Dana, New Haven, Conn.; Prof. P. Frazer, E. M., Philadelphia; Prof. F. A. Gentil, University of Pennsylvania, Philadelphia; E. Goldsmith, Philadelphia; J. D. Hagne, E. M., Survey of the Fortieth Parallel; Prof. N. P. Hill, Black Hawk, Colo.; W. H. Holmes, United States Geological Survey; Dr. G. A. Koenig, Philadelphia; Dr. O. Loew, Survey West of the One Hundredth Meridian; Prof. J. E. Mallett, jr., Canyon City, Colo.; W. McCree, E. M., Del Norte, Colo.; Dr. A. C. Peale, United States Geological Survey; Mr. Richard Pearce, Black Hawk, Colo.; Mr. Peters, E. M., Fairplay, Colo.; R. J. Raymond, United States Mining and Mineral Commissioner; Prof. J. F. L. Schirmer, Denver, Colo.; A. von Schnulz, E. M., Black Hawk, Colo.; Prof. B. Silliman, New Haven, Conn.; J. Alden Smith, State Geologist, Boulder City, Col.

An arrangement has been followed differing somewhat from that adopted in previous catalogues. So far as was possible, only well-accepted mineral species have been enumerated, without according specific positions to the varieties. The most popular names for certain species have been inserted, and references have been made leading to the name accepted by mineralogists. It is intended that every available analysis of Colorado minerals should be given. Necessarily many that have been made and might prove valuable cannot be obtained. So far as possible this intention has been carried out. Analyses of ores or metal-assays are not given, as they would be of no mineralogical value, however interesting to the miner and smelter.

A systematic enumeration of the species occurring has been given at the end of the catalogue. It is arranged in accordance with Dana's system of mineralogy. In addition thereto, reference is made to publications bearing upon the mineralogy of the State of Colorado.

Undoubtedly the most interesting mineral occurrence in Colorado is that of the tellurides. Gold, silver, lead, iron, merenry, and oxygen are combined with the tellurium, forming compounds that have either been considered heretofore as among the rarest, or were totally unknown to science. At no place have tellurides occurred in such large quantities and in such admirable form. As ores they are greatly sought after on account of the high percentages of gold and silver they contain. Another

rare occurrence is that of the pitchblende. It is to be regretted that the mine is not worked at present, and has not been for several years. Thus much that might be learned as to its distribution in the vein is lost.

Among those minerals classed as "ores," the argentiferous species are prominent in Colorado. Compounds of sulphur, antimony, tellurium, bismuth, arsenic, and other metals and metalloids with silver, are found in varying ratio. Galenite may be regarded as invariably silver-bearing. I have made more than a hundred assays of western galenites and have never failed to find the precious metal. It remains to be said that the percentage is highly variable, and that, as a rule, it is small unless argentite be present in the mineral. This is not unfrequently the case. It may be noticed that many very coarse-grained galenites show, upon breaking, dark gray, or black, dull, cleavage-planes. This is, in many instances, produced by a very thin coating of argentite.

It is not to be supposed that the number of minerals occurring at any particular locality could be fully ascertained by members of the survey while examining the region. During the regular field-work only such mineral localities will be obtained that happen to be found more or less accidentally. It may be hoped, therefore, that in future years more knowledge will be gained regarding the non-metalliferous minerals. Of these the enumeration at the present time is rather meagre.

Thus far but comparatively few epigene minerals have been found in Colorado, considering the large number of mines worked. With increasing depth of the mines, and time, no doubt the mineralogist will eventually be rewarded, and will find many a secondary mineral-product that now he looks for in vain. Upon undisturbed dumps a few such species have been collected.

Should further discoveries, or more complete examination of the mineral regions already known warrant it, I propose to prepare another edition of the catalogue whenever such preparation may seem advisable.

**ACTINOLITE.**—In radiated form, of light-green and bluish green color, on Mount Ouray; on Buffalo and Sopris Peaks; crystallized at Bergen's Ranch, Jefferson County; on Boulder Peak.

**AGATE.**—*See QUARTZ.*

**ALABANDITE.**—At Quartzville.

**ALABASTER.**—*See GYPSUM.*

**ALBITE.**—Quartz Hill, Central City; Gold Hill, Boulder County.

**ALMANDITE.**—*See GARNET.*

**ALLOPHANITE.**—Franklin Mine, in Gilson Gulch; Fowler and Wells's Branch, Sugar-Loaf district.

**ALTAITE.**—Red Cloud and Cold Spring Mines, Gold Hill. It occurs in various mines of the Sunshine district; minute crystals were obtained from the Red Cloud. Analyses, published by Genth,\* show the following result. The specimen was from the Red Cloud Mine:

	(1)	(2)
	Per cent.	Per cent.
Quartz .....	0.19	0.32
Gold .....	0.19	0.16
Silver .....	0.62	0.76
Copper .....	0.06	0.06
Lead .....	60.22	60.53
Zinc .....	0.15	0.04
Iron .....	0.48	0.33
Tellurium .....	37.99	37.51
	99.90	99.74

\* Proc. Am. Phil. Soc., Philadelphia. Vol. XIV., p. 226, 1876.

ALUM.—Mount Vernon.

ALUMINITE.—Mount Vernon.

AMALGAMITE.—Occurring in connection with coloradoite in the Keystone Mine, Boulder County.

AMBER.—(One specimen found near the head of Cherry Creek. This may, however, be one of the numerous resins occurring in the lignitic coal. They resemble amber, but differ in composition. See WHEELERITE.)

AMETHYST.—See QUARTZ.

AMIANTHITE.—North Boulder Creek.

AMPHIBOLITE.—Occurs at numerous localities in the dikes traversing granite. Small acicular crystals can be obtained from the porphyritic and sanidinitic trachytes. Good crystals are rare. Found on Buffalo Peaks; Montgomery; Head of Ohio Creek in volcanic breccia; on the Gunnison in trachytes.

ANALCITE.—In minute crystals in basalt, near Uncompahgre Peak.

ANDESITE.—Minute crystals in the trachytes near Black Mountain.

ANGLESITE.—Freeland Mine, on Trail Creek. In crystals at the Horse-shoe lead mine, in South Park. Clifton lode, at Central City. Prospector lode, in Arastra Gulch, near Silverton.

ANHYDRITE.—On Elk Creek. Crystallized at the salt-works in South Park.

ANTHOPHYLLITE.—North Boulder Creek.

ANTHRACITE.—Anthracite Creek; "O Be Joyful" Creek; in the Elk Mountains; in Uncompahgre Cañon. This anthracitic coal is of Lower and Upper Cretaceous age. Partly its greater age, partly other causes, have given to it the anthracitic character. Nearly all of it was originally simply bituminous coal. Dr. Peale, with reference thereto, says: "The eruption of the trachyte found near the coal first mentioned, probably so heated it as to deprive it of the bituminous matter." An analysis made by Dr. Peale of coal from Anthracite Creek furnished the following result:

Water .....	1.60
Fixed carbon .....	88.20
Volatile combustible matter .....	3.40
Ash .....	6.80

An average taken from seven analyses of Elk Mountain anthracite furnishes:

Water .....	2.757
Fixed carbon .....	77.360
Volatile combustible matter .....	13.620
Ash .....	6.291
Specific gravity .....	1.740

ANTIMONY.—Gold Hill; found there in minute crystals.

ANTRIMOLITE.—See MESOLITE.

APATITE.—At Fairplay.

APOPHYLLITE.—Hunt's Peak. Reported from some of the basalts near San Luis Valley.

ARAGONITE.—Occurring in the form usually termed *flos ferri*, very beautifully in Marshal's Tunnel, Georgetown, Golden. Table Mountain. In the trachytes near Del Norte; on the Rio Grande, above Fir Creek; at Idaho Springs.

ARFVEDSONITE.—Ocours in quartz in El Paso County. An analysis furnished Dr. G. A. Koenig the following result:\*

	Per cent.
Si O <sub>2</sub> .....	49.83
Ti O <sub>2</sub> .....	1.43
Zr O <sub>2</sub> .....	0.75
Al <sub>2</sub> O <sub>3</sub> .....	trace
Fe <sub>2</sub> O <sub>3</sub> .....	15.88
Fe O .....	17.95
Mn O.....	1.75
Na <sub>2</sub> O }	8.33
Li O }	
K <sub>2</sub> O.....	1.44
Mag O .....	0.41
Ignition .....	0.21
	97.97

ARGENTITE.—Colorado Central Mine, Terrible, and other mines near Georgetown; in the No-Name, Caribou, and others at Caribou; in some of the silver lodes near Nevada; in the Senator lode of the Hardscrabble district; in many of the lodes of the San Juan mining region associated with fahlerz and pyrargyrite. At the Silver Star, Moose, and other mines near Fairplay. Usually it is found in small, irregular particles or seams, rarely crystallized. Decomposition results in the formation of native silver.

ARSENOPYRITE.—Crystallized and massive in the Bobtail and Gunnell mines. Intimately associated with pyrite and chalcopyrite there. Generally auriferous. Together with silver and copper at the Park lode, Bergens ranch. Ocours also in the Priest Mine near Fairplay. With franklinite on Rio Dolores, Nevada district, Gilpin County.

ASBESTOS.—Ocours in small quantities, partly radiated, near Caribou.

ASPHALT.—Found in the White River region. It occurs in veins, is very compact and brittle. Ocours in springs near the summit of the Book Cliffs; Canyon City. (Loew.) Several of the petroleoid products of Colorado have been termed asphalt.

ASTROPHYLLITE.—Ocours in quartz on Cheyenne Mountain. Imbedded in quartz in El Paso County. An analysis furnished Dr. G. A. Koenig the following result:\*

	Per cent.
Si O <sub>2</sub> .....	34.68
Ti O <sub>2</sub> .....	13.58
Zr O <sub>2</sub> .....	2.56
Fe <sub>2</sub> O <sub>3</sub> .....	6.56
Al <sub>2</sub> O <sub>3</sub> .....	0.70
Fe O.....	26.10
Mn O .....	3.48
K <sub>2</sub> O.....	5.01
Na <sub>2</sub> O .....	2.51
Mag O .....	0.30
Cu O .....	0.42
Ta O <sub>2</sub> .....	0.80
H <sub>2</sub> O .....	3.54
	99.91

ATACAMITE.—On Kendall Mountain in some of the argentiferous lodes near Howardville.

AVVENTURINE FELDSPAR.—See ORTHOCLASE.

AVVENTURINE QUARTZ.—See QUARTZ.

\* Proc. Ac. Nat. Sci. Phil., Part i, 1877, p. 9.

**AZURITE.**—In the No-Name, together with malachite, the result of decomposition of fahlerz, Caribou; in the Rosita mines in Hardscrabble district; in the mines around Fairplay and Idaho; on Trail Creek; Crater Mountain; in the mines of the Elk Mountain district, Malachite lode, Bear Creek, Gendhemas lode, Tucker's Gulch. Generally the azurite is regarded as "blossom-rock" by the miners. If resulting from the decomposition of fahlerz it usually indicates silver-bearing ore. No crystals of any size were observed, the largest scarcely measuring 0.5 millimeter. Small, very brilliant crystals were found on Kendall Mountain, near Howardsville.

**BARITE.**—In clear, yellow, tabular crystals in the Tenth Legion Mine, at Empire; colorless crystals in the Terrible, at Georgetown; near Canyon City, transparent crystals are found in the arenaceous shales of that region. Crystals occur in the limestones near Fairplay; on the Apishpa River, crystals with fine terminations are found. Barite occurs also in Gilson Gulch, Georgetown; Montezuma; white, red, and brown in Clear Creek Cañon; on station 17 of 1873, and on station 46 of 1873. At the Rosita mines.

**BASANITE.**—See QUARTZ.

**BERYL.**—On Bear Creek, Tiffany's Ranch; Stone Dam, Jefferson County.

**BIOTITE.**—On Buffalo Peak and station 64 of 1873. Several of the trachytes, more particularly the porphyritic, contain small crystals of biotite. It is also found in some of the basalt. When decomposed it becomes splendid brown, otherwise it is very dark green, brown, or black.

**BISMUTH.**—French Gulch.

**BISMUTHINITE.**—In the Las Animas Mine, pseudomorphous. Dr. O. Loew\* mentions copper and iron as occurring in the bismuthinite of the Ward district. Occurs in the Pittsburgh Mine, Clear Creek County.

**BISMUTITE.**—From the Las Animas Mine, incrusting the preceding mineral.

**BITUMINOUS COAL.**—See COAL.

**BORNITE.**—Found on Rio Dolores; San Juan region; at Copperville, near Cañon City.

**BOURNONITE.**—Terrible Mine, near Georgetown, in small crystals.

**BRUCITE.**—On James Creek.

**CALAMINE.**—Park County.

**CALAVERITE.**—Associated with other tellurides in the Red Cloud. Good crystals have been obtained from Sunshine district. Found in the Keystone and Mountain Lion Mine, Boulder County. Gentz publishes an analysis of calaverite,† and obtains the following result:

	Per cent.
Au .....	38.75
Ag .....	3.05
Te .....	57.32
V <sub>2</sub> O <sub>3</sub> .....	0.05
Fe O .....	0.30
Al <sub>2</sub> O <sub>3</sub> Mg. O, &c .....	0.55
	<hr/>
	100.00

**CALCITE.**—In small crystals, scalenohedra, at the Monte Cristo Mine, Central; Mount Vernon; Bergen's ranch; rhombohedral crystals on Cheyenne Mountain; in the limestones of South Park; in the carboniferous limestones near the Arkansas River, lining cavities; sea-

\* Explorations and Surveys West of the 100th Meridian, vol. iii, p. 636.

† Zeitschr. für Kryst. und Min., P. Groth, vol. ii, No. 1, p. 6, 1877.

lenohedra in the Elk Mountain district; fibrous in Trout Creek Park; on Frying-pan Creek. Brown, rose-colored, yellow, and white on Table Mountain at Golden; scalenohedra and combinations of rhombohedra in quartz geodes near Ouray.

**Marble.**—Marble occurs at several localities in Colorado. North of the Gunnison near Taylor River Park is perhaps the most extensive deposit.

**CALEDONITE.**—Freeland Mine, Trail Creek.

**CAOLINITE.**—Camp near Mount Princeton. The white, chalk-like bluffs on Chalk Creek near Mount Princeton owe their appearance to the presence of caolinite. There it is the product of decomposed oligoclase.

**CARNALLITE.**—Salt-works, South Park.

**CARNELIAN.**—See QUARTZ.

**CERARGYRITE.**—Gilpin County lode, Black Hawk. Small compact quantities in the Wade Hampton Mine, Argentine, Caribou. Small specimens were obtained from the Red Cloud Mine, Gold Hill. At the Rosita mines. Reported from Upper Animas region.

**CERUSSITE.**—J. P. Whitney Mine; in very small crystals, Central; No-Name, Caribou; Caribou mine; Silver Hills mines and Rosita mines, in the Hardscrabble district. Freeland Mine, Trail Creek. In the Horseshoe Mine it occurs earthy, and is found throughout the mines of Elk Mountain district. Cañon City. Found also in the Prospector lode, Arastra Gulch, near Silverton.

**CHABAZITE.**—Golden, Colo., Table Mountain. In basaltic geodes near Uncompahgre Peak.

**CHALCANTHITE.**—On Clear Creek, below Black Hawk, in a deposit, and on several dumps near Central, in this case an epigene species of chalcopyrite.

**CHALCEDONY.**—See QUARTZ.

**CHALCOCITE.**—Bergen district, near Idaho City. Liberty lode, Bear Creek, Cañon City. At the Rosita mines.

**CHALCOPYRITE.**—Malachite and Pocahontas lodes, Bear Creek. Auriferous in the Bobtail, Winnebago, Dallas, Gunnell, Running, Kansas, Alps, California, and other mines at or near Central; mostly it occurs compact, intimately associated with pyrite. It is found in every paying gold mine of Gilpin County, and the miners seem to think a great portion of the "pay" dependent upon its presence. It also occurs in the Terrible, Pelican, Cold Stream, and other mines of Georgetown, as well as in those of Caribou and Hardscrabble. In the Trinidad gold-mining district, near Culebra Peak; in the gold and silver mines of Fair Play and the Elk Mountain district; on the Dolores River near Mount Wilson.

**CHLOANTHITE.**—Arkansas River.

**CHLORITE.**—On Mount Princeton; on Trail Creek; on Sopris Peak. At some localities chlorite replaces the mica either in granite or schists. Mostly, the mineral occurs only in very thin flakes without crystalline faces.

**CHLOROPHANITE.**—Bergen district.

**CHROMITE.**—Massive, Silver Hills and Fair Play.

**CHRYSOCOLLA.**—Champion lode, Trail Creek, Cañon City; Allen's copper mine, head of San Luis Valley.

**CHRYSOLITE.**—So far as can be determined, the chrysolite associated with the Fort Defiance garnets extends into Colorado. (Compare Lieutenant Wheeler's Annual Report 1875, Vol. iii., p. 105.)

**CHRYSPORASE.**—See QUARTZ.

COAL.—(Compare ANTHRACITE.) Coal occurs and is worked at a number of localities in Colorado. Two horizons, mainly of coal beds, can be distinguished—the Cretaceous and the Post-cretaceous. With the exception of the anthracoid coal of the Elk Mountains and adjacent regions, the Colorado coal is mostly a *coking* or *binding* bituminous coal. Some of the banks, however, furnish coal that cannot be utilized for coking purposes. All of this is the coal to which the term “lignite” has been applied. Cretaceous coal is found on the divide between the Uncompahgre and Cebolla, Elk Mountains, on the Lower Animas, the Florida, and on the La Plata. Post-cretaceous coal occurs along the Front Range: near Boulder, at Golden, at Colorado Springs, at Cañon, near Pueblo and Trinidad, and westward from that town. On Trout Creek Pass. In the region of the White River a number of coal veins are found, belonging to this group.

Four analyses of coal from the Animas region furnished the following average result:

Water .....	3.730
Fixed carbon .....	61.126
Volatile combustible matter .....	30.677
Ash .....	4.472
Specific gravity .....	1.346

Two analyses of coal from Boulder furnished the following average result:

Water .....	13.305
Fixed carbon .....	50.340
Volatile combustible matter .....	32.950
Ash .....	3.405
Specific gravity .....	1.270

Eleven analyses of coal from Golden gave the following average result:

Water .....	12.165
Fixed carbon .....	51.989
Volatile combustible matter .....	31.776
Ash .....	3.900
Specific gravity .....	1.341

Four analyses of coal from Colorado Springs presented the following average result:

Water .....	9.205
Mixed carbon .....	48.305
Volatile combustible matter .....	35.357
Ash .....	7.132
Specific gravity .....	1.325

Three analyses of coal from Canyon City furnished the following average result:

Water .....	5.090
Fixed carbon .....	56.053
Volatile combustible matter .....	35.226
Ash .....	3.630
Specific gravity .....	1.255

Five analyses of coal from Trinidad gave the following average result:

Water .....	0.792
Fixed carbon .....	55.768
Volatile combustible matter .....	32.483
Ash .....	11.133
Specific gravity .....	1.363

A total average prepared from thirty-four analyses of Colorado bituminous coal will furnish an idea as to its position in mineralogical classification.

Water .....	6.426
Fixed carbons .....	52.617
Volatile combustible matter .....	34.096
Ash .....	6.835
Specific gravity .....	1.325

**COLORADOITE.**—Occurs in Boulder County, in the Keystone Mine; in the Smuggler Mine, Ballerat district, Professor Genth furnishes several analyses.\* 1, Keystone Mine; 2 and 3, Smuggler Mine.

	(1) Per cent.	(2) Per cent.	(3) Per cent.
Hg .....	52.28	Quartz .....	2.90 3.05
Te .....	42.95	Au .....	3.46 7.67
Al <sub>2</sub> O <sub>3</sub> Fe <sub>2</sub> O <sub>3</sub> .....	2.44	Ag .....	2.42 7.18
V <sub>2</sub> O <sub>3</sub> .....	0.70	Hg .....	55.80 48.74
MgO .....	0.11	Cu .....	trace. 0.16
CaO .....	0.84	Zn .....	trace. 0.50
	99.32	Fe .....	1.35 0.92
		Te .....	36.24 34.49
			99.27 99.66

**COLUMBITE.**—Found occurring in prismatic needles piercing the Zircon of Pike's Peak.

**COPPER.**—Native; arborescent in the Gregory lode, Ward district, Boulder County; Bergen's ranch. Arborescent on Jones's Mountain; in almond-shaped nuggets in placers of Rio San Miguel.

**COPPERASITE.**—See JAROSITE.

**COVELLITE.**—Mosquito, Central City, Cañon City. (Loew.)

**CUPRITE.**—In crystals, from Sacramento Gulch and from the Sweet Home Mine, Malachite lode, Bear Creek, Gendhemas lode, Tuckers Gulch; massive on the Rio Dolores.

**DOLOMITE.**—From the Four-Mile Creek. Occurs as rock in a number of the formations of the State. Very rarely crystalized. Small geodes in Middle Cretaceous shales are sometimes lined with dolorite crystals.

**DYSCRASITE.**—Reported from the head of the Uncompahgre.

**EMBOLITE.**—Peru district; Snake River; Gold Hill.

**ENARGITE.**—Near Black Hawk. Found in the Powers Mine, Russell district, Gilpin County.

**EPIDOTE.**—Crystals associated with garnet on Gunnell Hill, Central. Throughout the metamorphics of the Front Range in minute crystals; crystals in the Sangre de Cristo Range; a large number of the hornblendic dikes contain massive epidote together with quartz. On the summit of Mount Bross; Lake Creek Cañon; Elk Mountain Range; on Trail Creek.

**FAHLERZ.**—Terrible, Colorado Central, Pelican, and other mines of Georgetown; No-Name, Caribou, and others at Caribou; Mount Princeton. Argentiferous, mostly antimonial, sometimes arsenical in the silver mines of the San Juan region. Crystals are very rare.

**FELDSPAR.**—See ANDESITE, LABRADORITE, OLIGOCLASE, ORTHOCLASE, and SANIDITE.

**FIRE CLAY.**—Golden, Ralston, Boulder, &c. Good fire-clay is obtained from the Animas coal-bearing beds.

**FLOAT-STONE.**—See PUMICE.

**FLOS FERRI.**—See ARAGONITE.

**FLUORITE.**—Terrible mine, Georgetown, in light-green cubes; in small crystals and massive, of violet color, on Mount McClellan and Gray's

(\*Zeitschr. für Kryst. und Min. P. Groth, vol. II, No. 1, 1877.)

Peak. On Bear Creek; massive, pink and violet in the Sweet Home Home Mine, Clear Creek, and James Creek. Massive on Kendall Mountain, Howardville.

**FRANKLINITE.**—Occurs in Mispickel (arsenopyrite), on Rio Dolores.

**FREIESLEBENITE.**—At the head of Cement Creek, near Baker's Park.

**GALENITE.**—In narrow seams, fine-grained in the Winnebago lode; feathery in the Dallas Mine; coarse-grained in the J. P. Whitney, Running, Monte Cristo, Forks, and other mines of Gilpin County. In the Colorado Central, Equator, Star, Pelieau, Terrible, and others near Georgetown, it occurs in very large quantities. At the Cold Stream very fine crystals are found, combinations of cube and octahedron, rarely rhombic dodecahedron. The International, on Mount McClellan, at an elevation of 12,800 feet, has a heavy vein of galenite. The No-Name, Fourth of July, Caribou, and others in Boulder County contain the mineral. Silver Hill mines (fine-grained) and the Rosita mines in Hardscrabble district. Hamilton, the mines around Fair Play show crystals; the mines of Elk Mountain district, the head of Iowa and Empire Gulch, contain galenite. In small, scattering quantities it is found almost throughout the State. Bear Creek, Grey Gulch. The Highland Mary, the mines of Cunningham and Arastra Gulches, on the forks of the Animas, in the Suezels and Uncompahgre districts. Throughout the San Juan mines galenite is one of the principal ores. Invariably it is argentiferous, although the quantity of silver it contains changes greatly.

**GARNET.**—Crystallized in rhombic dodecahedra and sometimes icositetrahedra, associated with epidote on Gunnell Hill, Central. This occurrence (*spessartite*) closely resembles the garnets from Auerbach, in Germany. Occurs frequently in micaeous schists, Ouray group, northern end of Sangre de Cristo Range. On Trail Creek, Bergen, &c. Montgomery, Bear Creek, Tucker's Gulch. Near the southwest corner of Colorado, found in drift (*almandite*).

**GLAUBER SALT.**—Bear Creek, Smoky Creek. At a number of hot springs in Colorado.

**GLOCKERITE.**—Central City, Idaho Springs.

**GOETHITE.**—Occurs with hematite on Topaz Buttes.

**GOLD.**—Native gold in very small and in distinct crystals in the Bob-tail, Gunnell, Kansas, and on Quartz Hill, near Central. In the gold gulches of Gilpin County. Many of these are worked out, others still yield nuggets and fine-gold. On Clear Creek, Tarryall Creek; Placer-diggings, near Fairplay, in imperfect crystals and laminae. In Washington and California Gulches; in the placers of Union Park, and many other localities. In the Elk Mountains. Placers on San Miguel, on the Mancos and La Plata. Near Parrott City; in the Little Giant Mine, near Silverton, associated with ripidolite. Occurring as the result of decomposition of the tellurids in the Red Cloud, Cold Spring, and other lodes near Gold Hill. In the Ward and Sugar Loaf districts. In the American, Grand View, Silver Dale, and other mines in the Sunshine district. Impregnated in volcanic rock in the Summit district. It is very finely distributed there, and contained in pyrite. Upon the decomposition of pyrite, gold becomes free. In the Little Amie it was first discovered in this district. At Oro City, in rhyolite. In some of the South Park mines, in Potsdam sandstone. At the Nevada lode, in aznrite. Very fine although small crystals have been lately obtained from the Gunnell, near Central. They are bright, in black sphalerite, and show combinations of cube, octahedron, and rhombic dodecahedron. Mixtures of gold and silver are found as the result of decomposition of tellurids containing both metals.

**GOSLARITE.**—On the dumps of the Wood lode, Leavenworth Gulch, near Central.

**GRAPHIC GRANITE.**—*See PEGMATITE.*

**GRAPHITE.**—Trinidad Mine, Las Animas County. Brad lode, San Juan district.

**GREENOCKITE.**—On sphalerite of the Dallas Mine, Black Hawk, Running Lode, Quartz Hill, Nevada. In mine of galena, on South Boulder.

**GYPSUM.**—Occurs at numerous localities.

*Gypsum.*—Compact in the Triassic and Cretaceous, sometimes Carboniferous formations.

*Selenite.*—Good crystals are rare. This form is more frequently found than the compact. Occurs in the Upper Carboniferous beds of Western and the Tertiary beds of Southern Colorado. In the Jurassic formation along the Front Range. On Eagle River, along the Lower White and Grand. Table Mountain, Golden.

*Alabaster.*—Occurs at Mount Vernon.

**HALITE.**—Salt-works of South Park, along some parts of the Platte River, in springs. Found at salt-licks in various parts of the Territory. Cañon City, Sinbad's Valley, Greenhorn Mountains.

**HEMATITE.**—

*Specular.*—Rhombs on quartz crystals, Topaz Buttes; Procer Hill, near Central; Phillip's Mine, Silver Hills; in the mines of Elk Mountain district, Bear Creek, Jefferson County, Unaweep Cañon. Fine crystals, iridescent, San Juan.

*Micaceous.*—Caribou, Ralston Creek, Unaweep Cañon, Sopris Peak. Single crystals on quartz and some inclosed in amethyst at the Little Giant mines, near Silverton.

*Fibrous.*—Phillips Mine, Silver Hills.

**HENRYITE.**—Found first at the Red Cloud and Cold Spring mines; later in all the telluride mines of Gold Hill, Ward, Sugar Loaf, and Sunshine districts. Fine crystals are very rare; minute ones are found, but rather imperfect. An analysis\* furnished the following result:

Pb.....	53.19
Fe.....	5.05
Ag .....	0.31
Au.....	trace
Te.....	41.45
Specific gravity .....	8.5253

(Compare altaite.)

**HESSITE.**—Gold Hill, Boulder County; a telluride that may be hessite has been found in the Hodgkiss lode, on the divide between Uncompahgre and Animas Rivers. A similar one is reported from the vicinity of Parrott City, on the La Plata. Prof. B. Silliman examined a specimen from the Red Cloud Mine,† and found: Au, 7.131 per cent.; Ag., 51.061 per cent. A specimen of hessite from the Red Cloud Mine, analyzed by Genth,‡ showed the following composition:

	Per cent.
Gold.....	0.22
Silver.....	59.91
Copper .....	0.17
Lead .....	0.45
Zinc.....	trace.
Iron .....	1.35
Tellurium.....	37.86

\* Rep. U. S. Geol. Surv., 1873, p. 353.

† Rep. U. S. Geol. Surv., 1873, p. 689.

‡ Proc. Am. Phil. Soc., Phila., vol. xiv., p. 297, 1876.

HESSITE, AURIFEROUS.—Genth has published\* three analyses. One of these gives the following results:

	Per cent.
Quartz .....	0.70
Gold .....	13.09
Silver .....	50.56
Copper .....	0.07
Lead .....	0.17
Zinc .....	0.15
Iron .....	0.36
Tellurium .....	34.91
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	100.01

HEULANDITE.—Small crystals in basalt near Uncompahgre Park.

HITCHCOCKITE.—See PLUMBOGUMMITE.

HORNBLENDE.—See AMPHIBOLITE.

HYALITE.—See OPAL.

HYPERSTHENE.—In some of the dikes of the Front Range.

IDOCRASE.—See VESUVIANITE.

IODYRITE.—A small fragment was found in some surface ore from the Red Cloud Mine, Gold Hill.

IRON.—Native in the Colorado meteorite found in 1866.

ISERITE.—Chug Water.

JAMESONITE.—Sweet Home Mine, San Juan. Summit district, near Del Norte.

JAROSITE.—On the dumps of the Wood Mine, Leavenworth Gulch, near Nevada.

JASPER.—See QUARTZ.

JET.—Wet Mountain Valley, Trinchera Mesa, Southeast Colorado. Occurs in narrow seams in most of the coal-bearing beds.

KALINITE.—See ALUM.

LABRADORITE.—Near Golden, in the dolerites. Near Fair Play, in the trap-rock. In the dolerites of Colorado, generally. No good crystals.

LANARKITE.—(Mine unknown, but probably in South Park.)

LEAD.—Native in Hall Gulch, Summit County. At Breckenridge. An announcement of native lead must always be received with necessary caution. The small specimen owned by Professor Schirmer I have seen, but although it had a very "natural" appearance, I was unable to decide.

LEPIDOLITE.—Rito Alto Peak, in a form resembling the Saxon zinnwaldite.

LEUCITE.—Table Mountain, Golden City.

LEUCOPYRITE.—Spanish Bar.

LIGNITE.—Mouth of Gunnison. There it retains its wood structure.

LIMONITE.—In the Tertiary sandstone, west of Plum Creek, near Colorado City; in several localities of South Park. At the head of South Fork of Anthracite Creek, west slope of Sangre de Cristo Range, above Mosco Pass. Numerous localities in White River region. The "kidney-ores" of lignitic group. Pseudomorphous after pyrite crystals at Central, Gilpin County.

LIONITE.—From the Mountain Lion Mine, Magnolia district. Professor Genth furnishes two analyses of the mineral.†

\* Rep. U. S. Geol. Surv., 1873, p. 689.

† Zeitschr. für Kryst. und Min., P. Groth, vol. II, No. 1, 1877. It is essentially a modification of tellurium (*q. v.*), and is intimately associated with quartz.

## Analyses:

	(1.)	(2.)
	Per cent.	Per cent.
Au.	1.38	1.53
Ag	0.25	0.25
Te	55.86	55.54
Si O <sub>2</sub>	34.72	35.91
Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub>	6.15	6.14
Mg O	0.17	0.19
Ca O	0.48	0.26
Total	99.01	99.82

**MAGNESITE.**—In small quantities in the Running lode at Black Hawk.

**MAGNETIC IRON.**—Bear Creek, Ralston Creek, Grape Creek.

**MAGNETITE.**—In loose nodules on Cuunell and Procer Hills, at Central; in small octahedric crystals in the gneissic rock on station 1. Occurring in the granites of various localities, Silver Hills, White House, Capitol; in the dolerite rocks generally. At Idaho and Caribou. Occurs near Golden. Octahedral crystals on Quartz Hill, near Central. On Grape Creek, near Cañon City, is an extensive deposit of magnetite, which is mined as iron ore.

**MAGNOLITE.**—From the Keystone Mine. It occurs, according to Genth,\* in capilloid and acicular crystals. It is the result of decomposition of coloradoite, and has the formula Hg<sub>2</sub>, TeO<sub>4</sub>.

**MALACHITE.**—Is found as the result of decomposition of sahlerz and other minerals at the Dallas, Leavenworth, and other mines near Central; at the No-Name, Caribou, Seven-Thirty, Fourth of July, and others, at Caribou; at some of the Georgetown mines; at the Hardscrabble mines, on Mount Princeton, and other localities; at Crater Mountain, in the mines of Fair Play and Elk Mountain district. Malachite lode, Bear Creek, Gendhemas lode, Tucker's Gulch, Oro City, Cañon City, Pollock, Montezuma. Allen's copper mine, head of San Luis Valley.

**MARCASITE.**—Philipps Mine, Fair Play.

**MELACONITE.**—Occurring at the Gunnell, Briggs, Leavitt, Leavenworth, and other mines near Central; at the Unknown Mine, in Montgomery, Tucker's Gulch, Jefferson County, Colorado. Pollock, Mosquito.

**MELANTERITE.**—On the dumps of the Wood, Dallas, and Kansas mines, and others, near Central; in the Sweet Home Mine.

**MERCURY.**—Native; associated with mercury-telluride in the Sunshine district, Boulder County.

**MESITITE.**—Black Prince lode, Lump Gulch.

**MESOLITE.**—Golden, Colo., South Table Mountain.

**MISPICKEL.**—See ARSENOPYRITE.

**MINIUM.**—Freeland Mine, Trail Creek, Georgetown, Central City. Dutchman lode, San Juan district.

**METEORIC IRON.**—See IRON.

**MOLYBDENITE.**—Leavitt mine, at Central; occurring in thread-like veins, in Silver Hills, near Fair Play, Boulder County. Douglass Tunnell, Georgetown; Alice Cary lode, San Juan district.

**MOLYBDITE.**—Alice Carey lode, San Juan district.

**MUSCOVITE.**—In good crystals on Mount Ouray, and in the coarse-grained granite near Cañon City; throughout the granite and partly in the schist rocks. Fine crystals from Topaz Buttes.

**NAGYAGITE.**—Gold Hill. This mineral is rare, and its identity is scarcely fully established.

\* Zeitschr. für Kryst. und Min., P. Groth, vol. II, No. 1, 1877.

**NATROLITE.**—Golden, Colo. Table Mountain. In cavities in the Basalt near Uncompahgre Peak.

**OBSIDIAN.**—Porphyritic, in a dike, at station 27 of 1873; Buffalo Peak, Arkansas Valley, and Union Park. Under the trachyte, on Gunnison River (porphyritic and spherulitic). A heavy vein of porphyritic obsidian occurs near the Rio Grande Pyramid, and continues from there southward in the trachytic beds. Nodules occur in the lower members of the trachytic series. A dike of obsidian, light-gray, clear sets across the Colorado Central lode near Georgetown. North of Saguache Creek with concentric structure.

**OLIGOCLASE.**—Occurs in many of the granites and in the volcanic rocks of Colorado. Good crystals are rare.

**OLIVINE.**—Transparent, green in the basalts of San Luis Valley.

**ONYX.**—See QUARTZ.

**OPAL.**—Aguas Calientes, Gilson Gulch; Idaho Springs, here the Opal occurs in narrow seams in the granite; mostly it is brownish; milk-white at Colorado Springs.

*Semi opal.*—Found together with the Chaledonies at the Los Piños agency. North of Saguache Creek in trachyte.

*Wood opal.*—On Cherry Creek, near Florissant, South Park.

*Hyalite.*—In the trachytes, near the Los Piños agency. At the Hot Sulphur Springs, Middle Park. Basalt of North Mam. Sometimes occurring in very fine specimens in the trachorheites of the Uncompahgre groups.

**ORTHOCLASE.**—Occurs in very fine, though small crystals, on Bobtail and Gregory Hills at Central. Crystals there are either simple or Carlsbad twins. It is found in very large pieces in some of the coarse-grained granites. Near Mount Ouray this is particularly the case. Large tablets of flesh-colored orthoclase can there be found. Crystals of large size, simple and twins, occur in the porphyritic dikes at Gold Hill, Boulder County, at the head of Chalk Creek, interlaminated with oligoclase in the porphyritic protoginete. Crystallized in Jefferson County; greenish in South Park, west of Pike's Peak; reddish on Elk Creek; brown and gray at various localities near Central City. Beautiful, green crystals of orthoclase are found on Bear Creek, near Pike's Peak, associated with smoky quartz. An analysis by Dr. Oscar Loew\* of this orthoclase furnishes the following result:

	(1)	(2)
Silicic acid.....	67.01	63.12
Alumina.....	19.94	19.78
Protoxide of iron.....	0.89	1.51
Soda.....	3.15	2.11
Potassa.....	8.84	12.57
Lime.....	trace.	0.66
Magnesia.....	trace.	0.13
	99.83	99.88

The coloring of this orthoclase, therefore, is due to a small percentage of protoxide of iron.

Dr. G. A. Koenig† regards the coloring-matter of this green orthoclase as dependent upon a ferric compound, probably an "organic salt."

**OZOCERITE?**—From head Cherry Creek.

\*Ann. Rep. Expl. and Surv. West 100th Mer., App. L. L., 1875, p. 111.

†Proc. Ac. Nat. Sci., Phil., Part II, 1876, p. 155.

**PARGASITE.**—Small particles in quartz. In a dike north of Centre-ville.

**PEGMATITE.**—At several localities in the vicinity of Georgetown, Bear Creek and Gold Hill, in Boulder County. Mount Ouray.

**PETROLEUM.**—From the oil-wells in Oil Creek Cañon, to the east of Canyon City. Smoky Creek, 10 miles south of Golden.

**PETZITE.**—In the gold mines of Gold Hill, occurring in narrow seams and veins. This mineral occurs also in the other telluride districts. Reported from Lake district. An analysis published by Genth\* furnishes the subjoined result:

	Per cent.
Quartz .....	0.62
Gold.....	24.10
Silver.....	40.73
Copper .....	trace
Bismuth .....	0.41
Lead .....	0.26
Zinc.....	0.05
Iron .....	0.78
Tellurium .....	33.49
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	100.44

**PHLOGOPITE.**—Mount Princeton; probably a number of the small, splendid brown crystals in granites are phlogopite.

**PICKERINGITE.**—This mineral was found by Dr. John Le Conte near Monument Park. It is crystallized in thin needles. An analysis furnished E. Goldsmith the following result:†

	Per cent.
Si O <sub>2</sub> .....	38.69
Al <sub>2</sub> O <sub>3</sub> .....	11.90
Mg O .....	4.89
(K <sub>2</sub> O Na <sub>2</sub> O).....	0.68
Sand .....	1.90
By diff. H <sub>2</sub> O .....	41.94
	<hr/>
	100.00

**PITCHBLENDE.**—*See URANINITE.*

**PLUMBOGUMMITE.**—On lead and copper minerals of the Dallas lode near Black Hawk.

**POLYBASITE.**—In tabular crystals at the Terrible mine, near Georgetown, Clear Creek County.

**PRASE.**—*See QUARTZ.*

**PREHNITE.**—Fair Play, in some of the mines.

**PROUSTITE.**—Occurring in the Brown lode, intermixed with galenite.

**PSEUDOMALACHITE.**—Little Platte River, south of Fair Play.

**PSILOMELANE.**—Seaton Mine, Idaho; occurs in small quantities.

**PYRARGYRITE.**—In the Colorado Central, Terrible, International, Cold Stream mines, at Georgetown, associated with galenite, fahlerz, and sphalerite. In the Brown lode with galenite; Argentine, Georgetown; in many of the Georgetown silver mines; in the mines near Fair Play; in the mines of the San Juan district. Fine crystals occur in the Wheel of Fortune lode, Mount Sneffels district, San Juan.

**PYRITE.**—Pyrite is one of the most widely-distributed minerals of the State. It is found in all the mines of Gilpin County. It occurs in the Empire mining district, in the Gold Hill mines; in the Trinidad gold mining district; in the Summit district; in the San Juan and Lake districts; in Summit district; in the mining districts of South

\* Proc. Am. Phil. Soc., Phil., Vol. XIV, p. 227, 1876.

† Proc. Am. Nat. Sci., Phil., Part III, 1876, p. 333.

and North Parks. Mostly it is auriferous and associated with chalcopyrite. Found both massive and crystallized. Massive in the Leavitt, Briggs, Kausas, Bobtail, and other mines near Central. Large bodies of it occur in the Mammoth, Gunnell, Grand Army, and other lodes near Central. Cubes in combination with the pentagonal dodecahedron are found in the Winnebago, Mack, Dallas, Kansas, Grand Army, Gunnell, and other mines at Central. Crystallized and massive in the mines of Silver Hills, Buckskin, Idaho; in the Tenth Legion mine at Empire; in the Elk Mountain district. Cubes are found in the Granite of the Mount Princeton group, on Eagle River in the mines of Summit district. Cubes of four to five inches edge in the Phillips mine. Cubes and octahedra, simple and in combination in the San Juan district. Pentagonal dodecahedra in the Bobtail and Briggs at Central. Octahedra at the head of the Uncompahgre. Octahedra on Anthracite Creek.

*Radiated pyrite* (possibly *Markasite*).—Smoky Hill River; Purgatory, Apishpa Creek.

**PYROLUSITE.**—Massive at Buckskin and in Silver Hills. Eureka Gulch near Howardsville, San Juan.

**PYROMORPHITE.**—Freeland lode, Trail Creek.

**PYROXENE.**—Near Fair Play. In a number of localities in younger volcanic and metamorphic rocks. Crystals in the basalts of Southern San Luis Valley.

**PYRRHOTITE.**—Malachite lode, Jefferson County. Nevada district, Gilpin County.

**QUARTZ.**—Occurs massive in some of the very coarse-grained granites. Many of the quartz-veins are almost or totally devoid of ore, in which case the quartz is generally milk-white and pure.

*Crystals*, very pretty quartz crystals, small; occur on Quartz Hill near Central. The Bobtail, Gunnell, Briggs, and other mines near Central furnish good, small crystals. In the Rosita lodes and in some of the mines of Georgetown. On East River; in the mines of the Elk mountain district; Iowa Gulch; Sopris Peak; head of Anthracite Creek. Good crystals with many combinations of the pyramidal faces are found on Topaz Butte. Dihexahedral crystals occur in the porphyry of the Sangre de Cristo range and in the rhyolite near Uncompahgre Peak. At Spanish Peaks.

*Smoky quartz*.—The locality on Bear Creek near Pike's Peak has become well known on account of its smoky quartz crystals associated with green orthoclase. Large crystals, reaching over a foot in length, are there found, in cavities of the granite. Crystals are also found on Elk Creek and on the Upper Platte.

*Rosy quartz*.—Occurs at many localities in Colorado, in the granites. Good specimens can be obtained from the head of Roaring Fork. Found, also, near Clear Creek, and on Bear Creek.

*Amethyst*.—Small crystals at Nevada and neighboring localities; on Rock Creek; Clear Creek County; on the summit of the range east of the Animas.

*Agate*.—Fine specimens, lined with amethyst, on the summit of the range east of the Animas. Cloudy, of white and gray color, in the lower trachytic formations of the Uncompahgre group; in various forms, cloudy, banded, laminated, and variegated, at the Los Pinos agency. In South Park, in the drift; in the Lower Arkansas Valley; on the Frying Pan; throughout Middle Park; on the Lower Gunnison and adjacent regions.

*Moss-agate*.—Below the Uncompahgre, near Grand River.

*Chalcedony*.—Chalk Hills, eight miles south of Cheyenne Mountain; at the Los Pinos agency; on the bluffs near Wagon-Wheel Gap; along the Upper Rio Grande Valley; in Middle and South Parks; Buffalo Park; Fair Play; Frying Pan; Front Creek; Gunnison River. Found frequently in drift accumulations.

*Flint*.—Occurs together with chalcedony. Found very frequently in the lower members of the trachytic series.

*Aventurine quartz*.—On Elk Creek.

*Chrysopase*.—Rare in Middle Park.

*Carnelian*.—Middle and South Parks; Los Pinos agency.

*Onyx*.—Middle Park.

*Sardonyx*.—Middle Park.

*Basanite*.—East of the salt-works in South Park. It is found, together with flint, in some of the trachytes.

*Prase*.—Middle Park.

*Jasper*.—Green and red, station 33 of 1873. Yellow, red, brown, and gray at the Los Pinos agency. Throughout Middle and South Parks; along the Gunnison, Dakota group, Arkansas, Grand, White, Animas, and other rivers in the drift. Occurs also in some of the trachytes, mostly red, brown, and green. The best locality for this horizon is at the junction of Lost Trail Creek and the Rio Grande.

*Siliceous sinter*.—South Park.

*QUICKSILVER*.—See MERCURY.

*RHODOCHROSITE*.—Sweet Home Mine, Park County, in very beautiful specimens; in the Diadem Mine.

*RHODONITE*.—Enreka Gulch, near Howardsville; San Juan.

*RIPIDOLITE*.—Trail Creek, Clear Creek County, Colorado. In the Little Giant lode, Arastra Gulch, and in the Crystal Lode, Silverton.

*BOSCOLITE*.—A greenish mineral, intimately associated with quartz, found at the Keystone and Mountain Lion Mines, in Boulder County. Genth publishes an analysis,\* with the following result:

	Per cent.
Li O <sub>2</sub> .....	57.15
Al <sub>2</sub> O <sub>3</sub> .....	19.94
V <sub>2</sub> O <sub>3</sub> .....	8.44
Mn O .....	trace
Fe O .....	3.51
Mg O .....	2.87
Li <sub>2</sub> O .....	trace
Na <sub>2</sub> O .....	0.94
K <sub>2</sub> O .....	8.11
H <sub>2</sub> O .....	not determined
	100.96

*RUTILE*.—On the Ute pass, occurring in quartz.

*SANIDITE*.—Occurs throughout the trachorhites, sometimes in very handsome crystals. Wherever the trachytes have been reheated the sanidite is adularizing.

*SARDONYX*.—See QUARTZ.

*SCHAPBACUITE*.—Occurs near Georgetown.

*SCHEELITE*.—Crystals are reported from some of the mines near Baker's Park.

*SCHIRMERITE* (Endlich).—Red Cloud and Cold Spring Mine, Gold Hill. Occurs also in the other telluride districts. A specimen from the Red Cloud furnished,† gold, 18.82; silver, 28.60 per cent. (See PETZITE.)

\* *Zeitschr. für Kryst. und Min.* P. Groth, vol. ii, No. 1, p. 11, 1877.

† *Rep. U. S. Geol. Surv.*, 1873, p. 354.

SCHIRMERITE (Genth).—With tellurides at the Red Cloud Mine, Gold Hill. An analysis by Professor Genth furnished :\*

	(1)	(2)
	Per cent.	Per cent.
Pb.....	12.69	12.76
Ag.....	22.82	24.75
Bi.....	46.91	47.27
Zn.....	0.08	0.13
Fe.....	0.03	0.07
S.....	14.41	15.02
	96.94	100.00

SCIREIBERSITE.—In the Colorado meteorite.

SELENITE.—See GYPSUM.

SEMIOPAL.—See OPAL.

SERPENTINE.—Small specimens of serpentine occur in the metamorphic rocks of Mosco Pass.

SIDERITE.—Crystallized in South Park, Gold Hill, Colo.; Veto lode, Gibson Gulch; Rob Roy lode, Central City. At the Rosita mines.

SILVER.—Native, as wire-silver, at the Terrible, Georgetown; at the International, on Mount McClellan; as wire-silver in the No-Name and Caribou mines, at Caribou. In small nuggets and thin scales near Fair Play in Washington Gulch, Homestake lode; Sunshine; Gold Hill; Blue River, Montezuma; Jones Mountain and Mount Sneffels, San Juan.

SINTER CALCAREOUS.—See TUSA.

SINTER-SILICEOUS.—See QUARTZ.

SMITHSONITE.—Jones's Mine on sphalerite, near Central, Running lode, Black Hawk.

SODA.—Carbonate, from the Hot Springs.

SODIUM-CHLORIDE.—See HALITE.

SODA-SULPHATE.—See GLAUBER-SALT.

SPESSARTITE.—See GARNET.

SPHALERITE.—Occurs in almost every mine; only few exceptions take place. In the lead-silver mines it is more abundant than in the gold mines. It is found in the Winnebago, dark brown, Dallas, Gunnell, J. P. Whitney, Kansas, Wood, California, Running, Bobtail, Briggs (small quantities in these two), Monte Cristo, and numerous other mines in the vicinity of Central. The mines of Georgetown invariably contain it. The Caribou mines show at times large quantities of the mineral. Mount Princeton: sphalerite, containing cadmium, found in several mines near Fair Play. Occurs in nearly all the mines of the San Juan region. Varies in color from greenish yellow to brown and black. Brilliant crystals are found in the Terrible lode at Georgetown.

SPINEL.—Crystal Mine, Virginia Cañon.

STAUROLITE.—Simple and twin crystals in the micaceous schists near Mount Oso, Quartzite Mountains.

STERNBERGITE (iron and silver sulphide).—Georgetown. (Loew.)

STEPHANITE.—Colorado Central, Georgetown, Moose Mine, near Fair Play, Montezuma, and other localities.

STIBNITE.—Terrible Mine, near Georgetown, Boulder County.

STILBITE.—Very fine crystals in cavities of basalt, near Uncompahgre Peak.

**SULPHUR.**—In small crystals on galenite from the Clifton Mine, near Central; found in Middle Park, Pagosa Springs. Sometimes found in narrow seams in galenite, the result of decomposition of the latter.

**SYLVANITE.**—In the Red Cloud Mine, of Gold Hill, occurring in foliated masses and thread-like veins. In crystals and crystalline masses in the Sunshine district. According to Professor Silliman\* the ratio of gold and silver for a specimen from the Red Cloud, is, gold 1.7 to silver 1.0. Professor Genth publishes an analysis of sylvanite obtained from the Red Cloud Mine,† showing the following composition:

	Per cent.
Quartz.....	0.32
Gold.....	24.83
Silver.....	13.05
Copper.....	0.23
Zinc.....	0.45
Iron.....	3.28
Tellurium.....	56.31
Selenium.....	trace.
Sulphur.....	1.82
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	100.29

**TALC.**—In fine scales among the gangue-rock of the Bobtail and Kansas, near Central. In light pink scales in the Silver Hills and Barton mines, Hardscrabble district. In Mosco Pass.

**TELLURITE.**—A new species described by Dr. Genth.‡ It is the result of decomposition of tellurium and sellurides. Its formula is  $\text{Te O}_2$ . Found in the Keystone, Smuggler, and John Jay mines in small crystals.

**TELLURIUM, NATIVE.**—At the Red Cloud Mine, of Gold Hill, in crystalline masses, belonging to the hexagonal system. The largest specimen known was obtained by Professor Schirmer from the Red Cloud Mine. It weighed about five pounds, and consisted in a mixture of quartz and tellurium. Upon examination§ it was found to contain 90.85 per cent. of tellurium, small quantities of selenium, iron, and bismuth, and traces of gold and silver. Professor Silliman|| did not find any selenium.

Genth publishes an analysis of tellurium from the Magnolia district, Boulder County.¶

An.....	0.60
Ag.....	0.07
Te.....	96.91
$\text{V}_2 \text{O}_3$ .....	0.49
Fe O.....	0.78
$\text{Hg Al}_2 \text{O}_3 \text{ Mg O K}_2 \text{O}$ , &c.....	1.15
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	100.00

**TENNANTITE.**—Crystals in Buckskin Gulch; Geneva district; Park County. Freeland Mine, Clear Creek County.

**TETRAHEDRITE.**—Crystals in Buckskin Gulch. Fine crystals in the Clifton lode, Central City. Crystals in the Colorado Chieftain lode, San Juan district. Massive in a number of the San Juan silver-mines.

\* Rep. U. S. Geol. Surv., 1873, p. 690.

† Proc. Am. Phil. Soc., Philadelphia, vol. xiv, p. 288, 1876.

‡ Zeitschr. für Kryst. und Min. P. Groth, vol. ii, No. 1, p. 7, 1877.

§ Compare Rep. U. S. Geol. Surv., 1873, p. 355.

|| Ibid., p. 685, and Am. Jour. Sci. xlii, p. 571.

¶ Zeitschr. für Kryst. und Min. P. Groth, vol. ii, No. 1, 1877.

**TORBERNITE**.—(URANITE.) Found by Captain Berthoud on Lyden Creek.\* Probably mostly decomposed. Found on Grifith Mountain, Clear Creek County.

**TOURMALINE**.—In the quartz of Gunnell Hill, near Central; on Running Hill, at Black Hawk; on Guy Hill, and at Nevada; in quartz north of the Arkansas River. Crystals with both terminations at Montgomery; on Ralston Creek. All tourmaline of Colorado is either black or dark brown.

**TREMOLITE**.—Smith's Fork of the Gunnison River.

**TUFA**.—Calcareous. On Currant Creek; Roaring Fork; Frying Pan. At the mineral springs of White Earth, Wagon-Wheel Gap, Pagosa, Animas, and in Uncompahgre Park.

**TURQUOISE**.—Southern Colorado. (Doubtful.)

**URACONITE**.—Wood lode, Leavenworth Gulch, near Nevada.

**URANINITE**.—Occurs in large quantities, massive in the Wood lode, Leavenworth Gulch, near Nevada. An analysis by Dr. O. Loew† furnishes the following result :

Uranoso-uranic acid .....	11.37
Sulphides of iron and copper .....	45.81
Gangue (quartz by difference) .....	42.82

**URANOCHALCITE**.—Wood lode, Leavenworth Gulch, near Nevada.

**VESUVIANITE**.—In large crystals of simple combinations on Mount Italia. North of Arkansas River, in the granite.

**WAVELLITE**.—South Table Mountain, at Golden.

**WHEELERITE**.—Described by Dr. Oscar Loew.‡ This mineral, which is quoted from New Mexico, probably also occurs in the coal of Colorado. It is a resin, related to amber. Its existence in each particular instance, however, can only be determined by analysis, on account of its physical resemblance to other resins occurring in the same manner. The analysis of Wheelerite by Loew furnishes :

	(1)	(2)
	Per cent.	Per cent.
Carbon .....	73.07	72.87
Hydrogen .....	7.95	7.88
Oxygen .....	18.98	19.25

**WILLEMITE**.—Jones's Mine, Central City.

**WOLFRAMITE**.—Reported from Southern Colorado.

**WOLLASTONITE**.—Occurs in small quantities in some of the limestones near Fair Play.

**WULFENITE**.—Is found in Park County; at Gold Hill, Boulder County.

**XENOTIMITE**.—Reported from Cheyenne Mountain.

**ZINCITE**.—Jones's Mine, Central City.

**ZIRCON**.—Bear River; Middle Park. In small crystals. Crystals of zircon are found in the feldspar of Pike's Peak. Dr. G. A. Koenig§ has furnished the following analysis:

	Per cent.
Si O <sub>2</sub> .....	28.00
Mg O. ....	8.93
(Fe <sub>2</sub> O <sub>3</sub> ) Zr O <sub>2</sub> .....	60.00
H <sub>2</sub> O .....	3.47
	100.40

\* Proc. Ac. Nat. Sci. Phil., Part II, 1875, p. 363.

† Rep. Expl. and Surv. West 100th Mer., vol. iii, p. 636.

‡ Rep. Expl. and Surv. West 100th Merid., vol. iii, p. 630, and Am. Jour. Sci., vol. xlii, p. 571.

§ Proc. Ac. Nat. Sci. Phil., Part II, 1876, p. 156.

Zircon has also been found in quartz in El Paso County. An analysis furnished Dr. Koenig the following result:\*

	Per cent.
Si O <sub>2</sub> .....	29.70
Zr O <sub>2</sub> .....	60.98
Fe <sub>2</sub> O <sub>3</sub> .....	9.20
Mg O .....	0.30
	<hr/>
	100.18

ZINKENITE.—Sweet Home Mine, small crystals.

ZIPPEITE.—Wood lode, Leavenworth Gulch, near Nevada.

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\*Ibid., Part I, 1877, p. 9.

## SYSTEMATIC ARRANGEMENT OF COLORADO MINERALS.\*

## I. NATIVE ELEMENTS.

Gold (1).	Lead (15).
Silver (2).	Antimony (18).
Quicksilver (8).	Bismuth (20).
Amalgam (9).	Tellurium (21).
Copper (12).	Sulphur (22).
Iron (13).	Graphite (25).

## II. SULPHIDS, TELLURIDS, SELENIDS, ARSENIDS, ANTIMONIDS, BISMUTHIDS.

## A. SIMPLE SULPHIDS, &amp;c.

Stibnite (29).	Pyrrhotite (68).
Bismuthinite (30).	Greenockite (69.)
Molybdenite (34).	Schreibersite (74).
Dyserasite (35).	Pyrite (75).
Schapbachite (36 A).	Chalcopyrite (78).
Argentite (40).	Chloanthite (83.)
Galenite (44).	Marcasite (90).
Altaïte (48).	Leucopyrite (91).
Bornite (49).	Arsenopyrite (94).
Alabandite (52).	Sylvanite (98).
Sphalerite (56).	Calaverite.
Hessite (58).	Nagyagite (99).
Chalcocite (61).	Covellite (100).
Sternbergite (63).	

## B. DOUBLE SULPHIDS, &amp;c.

Zinkenite (106).	Bournonite (119).
Jamesonite (112).	Tetrahedrite (124).
Schirmerite (112 A).	Tennantite (127).
Freieslebenite (114).	Stephanite (130).
Pyrargyrite (117).	Polybasite (131).
Proustite (118).	Enargite (132).

## III. COMPOUNDS OF CHLORINE, BROMINE, IODINE.

Halite (138).	Iodite (143).
Cerargyrite (140).	Carnallite (147).
Embolite (141).	Atacamite (153).

\* The classification herein adopted is that given by Dana in his "System of Mineralogy." The numbers placed in parentheses after the mineral-names, correspond to the numbers given by Dana.

## IV. FLUORINE COMPOUNDS.

Fluorite (159). (Chlorophanite).

## V. OXYGEN COMPOUNDS.

## A. OXYDS.

## 1. Oxyds of elements of series I.

## A. Anhydrous.

Cuprite (172).	Franklinite (188).
Zincite (176).	Chromite (189).
Melaconite (178).	Uraninite (190).
Hematite (180).	Rutile (193).
Iserite (181 A).	Minium (197).
Spinel (183).	Pyrolusite (199).
Magnetite (186).	

## B. Hydrous.

Goethite (204).	Brucite (210).
Limonite (206).	Psilomelane (217).

2. Oxyds of elements of series II.  
Molybdite (224).3. Oxyds of carbon-silicon group.  
Quartz (231). | Opal (232).

## A. TERNARY OXYGEN COMPOUNDS.

## 1. SILICATES.

## A. Anhydrous.

Hypersthene (235).	Phlogopite (288).
Wollastonite (237).	Biotite (289).
Pyroxene (238).	Astrophyllite (292).
Rhodonite (241).	Muscovite (293).
Anthophyllite (246).	Lepidolite (294).
Amphibolite (247).	Leucite (309).
Arfvedsonite (248).	Labradorite (311).
Beryl (254).	Andesite (312).
Chrysolite (259).	Oligoclase (314).
Willemite (266).	Albite (315).
Garnet (271).	Orthoclase (316).
Zircon (272).	Tourmaline (320).
Vesuvianite (273).	Staurolite (333).
Epidote (276).	

## B. Hydrous.

Chrysocolla (346).	Apophyllite (370).
Calamine (361).	Allophanite (374).
Prehnite (363).	

*Zeolite section.*

Natrolite (378).	Chabazite (386).
Mesolite (381).	Stilbite (392).
Analcite (383).	Heulandite (394).

*Margarophyllite section.*

Talc (399).	Caolinite (419).
Serpentine (411).	Ripidolite (450).

## 2. COLUMBATES.

Columbite (474.)

## 3. PHOSPHATES.

*A. Anhydrous.*

Xenotomite (490).	Pyromorphite (493).
Apatite (492).	

*B. Hydrous.*

Pseudomalachite (543).	Turquoise (563).
Wavellite (554).	Torbernite (572).
Plumbogummite (556).	

## 4. TUNGSTATES AND MOLYBDATES.

Wolframite (610).	Wulfenite (617).
Scheelite (614).	

## 5. SULPHATES.

*A. Anhydrous.*

Barite (630).	Calcedonite (636).
Anhydrite (632).	Glauberite (640).
Anglesite (633).	Lanarkite (641).

*B. Hydrous.*

Gypsum (654).	Aluminite (688).
Melaunterite (664).	Jarosite (691).
Goslarite (666).	Glockerite (696).
Chalcanthite (669).	Uranochalcite (706).
Kalinite (674).	Zippeite (708).
Pickeringite (678).	Uraconite (710).

## 6. CARBONATES.

*A. Anhydrous.*

Calcite (715).	Rhodochrosite (722).
Dolomite (716).	Smithsonite (723).
Magnesite (718).	Aragonite (724).
Mesitite (719).	Cerussite (729).
Siderite (721).	

*B. Hydrous.*

Trona (738).	Azurite (752).
Malachite (751).	Bismutite (753).

## VI. HYDROCARBON COMPOUNDS.

Ozocerite (780).	Asphaltum (830).
Succinite (799).	Mineral coal (831).

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